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TECHNICAL NOTE
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INTERIM INSTRUCTIONS FOR THE USE OF THE NATIONAL METEOROLOGICAL CENTER AIR POLLUTION POTENTIAL (APP) PRODUCTS

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Purpose

USAF ETAC Technical Notes are published by the USAF Environmental Technical Applications Center to disseminate aerospace sciences information to units of the Air Weather Service. Subject matter contained in these Technical Notes, while pertinent, is not deemed appropriate for publication as Air Weather Service Technical Reports which are confined to those studies, reports, techniques, etc., of a more permanent and specific nature. Technical Notes include such material as wing seminar listings, bibliographies, special data compilations, climatic studies, and certain USAF ETAC project reports which may be of special interest to units of the AWS organization. This series is published under the provision of AFR 6-1 and AWSR 80-2, as amended.

Distribution

Technical Notes will normally be given the same distribution as AWS Technical Reports which includes all AWS units through detachment level. Additional special distribution may be provided certain issues when the subject matter is believed to warrant wider dissemination within the scientific community. A smaller distribution of the Notes will be made when the area of interest and applicability is considered limited.

PREFACE

These instructions are to aid the detachment forecaster in interpreting and tailoring the Air Pollution Potential facsimile charts and teletype messages produced by the National Meteorological Center (NMC) for his mission requirements. These instructions will be revised when required to reflect accumulated field experience. Until that time, they will be entitled "Interim Instructions."

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SECTION A — GENERAL

1. Introduction.

Air Weather Service is responsible for developing and maintaining procedures for interpreting and tailoring National Weather Service (NWS) APP forecasts for USAF installations; a responsibility assigned by paragraph 4b(3), AFR 161-22. This report explains how to use these forecasts and how to tailor them for local application.

2. USAF and AWS References.

a. Environmental Pollution Control, AFR 161-22, 23 September 1970.

b. AWS Operations Digest, October and November 1970, pages 15 and 19, respectively.

c. The National Air Pollution Potential Forecast Program, ETAC TN 70-9, November 1970.

d. Local Air Pollution Forecasting, an AWS Technical Report to be published.

3. Guidelines.

a. Judgment. The routine application of meteorology to local air pollution control is relatively new. The National Weather Service, for example, has only recently established Environmental Meteorological Support Units (EMSU). There is, therefore, limited experience for developing field guidance. This means that forecasters will have to use the experience and judgment developed in related areas of meteorology in using APP forecasts as part of their environmental support services.

b. When to Issue a Pollution Forecast. Procedures for disseminating pollution forecasts should be developed in coordination with base pollution control authorities. These programs are usually administered by the base civil engineer with

assistance from the bioenvironmental engineers. Daily briefings of command or base personnel should mention expected pollution conditions.

c. Responsibility. Pollution control is a local command responsibility and decisions on pollution emissions will be made by the commander or his representative. Forecasters should advise only on the meteorological aspects of air pollution.

d. Coordination. As practicable, a forecast of high air pollution potential (HAPP) should be coordinated with the local EMSU meteorologist (see par. 4 below).

e. Operating Procedures. An SOP outlining procedures for issuing air pollution potential (APP) forecasts should be prepared where a requirement for such forecasts exists.

f. Overseas Locations. The Air Force Global Weather Central (AFGWC) is responsible for developing APP support for locations outside the NWS area of interest and for which AFGWC has "window" or mesoscale responsibilities.

g. Other Applications. The atmospheric parameters of pollution meteorology are useful mesoscale forecasting aids. Forecasters should look for possible application of these parameters to related problems such as fog and haze forecasting.

4. Environmental Meteorological Support Units (EMSUs).

Environmental Met Support Units are staffed by a forecaster and three meteorological technicians of the National Weather Service. A unit supports one or more Air Quality Control Regions (AQCR). More than 90 of the latter have been established in 1971. These are being established on a priority basis with generally those AQCRs of greatest and most frequent pollution receiving the first units. As practicable, a close working relationship should be established with the EMSU meteorologist. Present and planned EMSUs are listed in Appendix 2.

5. NMC Air Pollution Potential Information.

The NMC provides APP information by facsimile and teletype. The FOFAX circuit now carries one chart per day (soon to be increased to two per day). This furnishes macroscale APP information. The teletype information reaches AWS detachments by Comet III circuitry. Plain language discussions of the highlights of the synoptic situation affecting pollution and coded wind and temperature information affecting local atmospheric dilution capabilities are transmitted. A brief review of pollution concepts and a description of pollution criteria is an excellent starting point for a detailed discussion of the NMC products.

This review and description is provided in the next section.

SECTION B — DISCUSSION OF AIR POLLUTION CONCEPTS AND CRITERIA

1. Introduction.

Since air pollution emissions cannot be avoided in many instances, the meteorologist and base environmental pollution control authorities together attempt to minimize their ill effects by appropriate measures. By suggesting that pollution be permitted under certain atmospheric conditions, the meteorologist does not condone pollution. He accepts the need for compromise until workable pollution controls are possible and, meanwhile, assists the environmental control authorities in practical solutions to the problem of reducing air pollution. This problem is caused basically by a source contributing pollutants and an air space's inability to adequately dilute or disperse pollutants. Both factors must be kept in mind in thinking of air pollution potential. A brief discussion of pollutants is, therefore, appropriate.

a. Pollutants. These are particles, gases, or liquid aerosols in the atmosphere which have undesirable effects on man or his surroundings. The magnitude of the concentrations of these pollutants ordinarily determines their undesirable characteristics. Base air pollution control authorities have been directed to develop measures to keep these concentrations low. If, for example, air reaching an installation is pollution free, then the installation might be able to emit pollutants without exceeding undesirable concentrations even under restricted dispersion conditions. On the other hand, if the air reaching the installation is already saturated with pollutants, then even under good dispersion conditions, pollution emissions might not be advisable. Such cases can be resolved by predicting pollution concentrations through the application of diffusion theory to the known operating characteristics of the plant, factory, or other pollution source. Diffusion prediction is an AWS function and reference 2d provides guidance on this service. The APP products discussed here have only limited application to the pollution problems of base installations as noted in the next paragraph.

b. Limitations of APP Products. APP products and the dispersion criteria derived from them identify meteorological conditions associated with the large-scale buildup and dispersion of pollutants over or downwind of an urban area. Such areas

emit pollutants not only from elevated sources, such as stacks, but from ground-level sources as well. Downwind of the sources and over the city where pollutants from all these sources mix together, pollution concentrations correspond well with observed APP conditions. Contrast this with an AF installation with only one or possibly two elevated sources. To illustrate this point, consider a very stable ground inversion below stack height; it is very probable that stack emissions would drift over the installation above the inversion with little effect on ground pollution concentrations. Relative to the urban area, base pollution concentrations would be low and, effectively, the base might be considered pollution-free despite an APP forecast calling for poor dispersion conditions. In the urban area, on the other hand, ground-level sources of pollution from high volume vehicular traffic, numerous home and commercial heating installations, etc., would make up for the reduction in pollution from the elevated sources and verify the APP forecast. Forecasts of APP are, thus, most likely to describe dispersion conditions for AF installations within or downwind of urban areas. The forecasts can, however, be applied to installations in other locations. Here, however, only a general relation between APP forecasts and pollution concentrations will be observed. Forecasts of extremely good or poor dispersion conditions will probably verify well, but the moderate forecasts will show poor resolution among the various criteria defined in later paragraphs.

c. Significance of Term "Pollution Potential." It is emphasized that an APP forecast should take into account the potential of the air to accept and adequately dilute pollutants. The examples in paragraph a above illustrate this point. Reference 2c does not note the dependence of APP on wind direction because, for an urban environment with pollution sources covering a large area, pollution arrives from all directions. For a base, however, wind direction could be important to APP forecasting and, with the coordination of local control authorities who measure pollution concentrations, this dependence of APP on wind direction could be developed. In this connection, keep downwind locations in mind in recommending wind directions favorable for base pollution emissions. Avoid polluting neighboring living areas with base emissions.

2. Dispersion.

Atmospheric dispersion conditions are classified as good, moderate, or poor, the latter is a condition of high air pollution potential (HAPP). A brief discussion of the dispersion concepts described in reference 2c helps in understanding the terminology and their use in describing APP products.

a. Concepts. The idea of the atmosphere dispersing, diluting, or ventilating pollutants is easily visualized. With an

unstable lapse rate through a deep layer of the atmosphere and a strong wind, pollutants are spread through an extensive volume of the atmosphere and are diluted to minimal concentrations. On the other hand, a low inversion and a light wind confines emissions to a shallow atmospheric layer and pollutant concentrations are large. If the latter conditions persist and emissions continue, pollutant concentrations can become unacceptable.

b. Terms. Discussing dispersion quantitatively requires use of several terms, e.g., mixing height, transport wind speed, ventilation, and stagnation area. These are defined in Appendix 1 and a restating of dispersion concepts in these terms helps in understanding their significance.

c. Pollution Conditions. Atmospheric dispersion of pollutants is good, moderate, or poor depending on mixing depth (MXDP) and transport wind speed (TW). Whether these conditions will persist is governed by the presence or absence of a stagnation area. A synoptic situation with a deep unstable layer and a strong wind is described as having a large MXDP and a large TW; whereas, a synoptic situation with a low inversion and low wind speed is characterized as having a low MXDP and low TW. The product of MXDP and TW is termed ventilation and is a measure of the atmosphere's capability to dilute or to disperse pollutants. Stagnation area provides an objective delineation of a geographical area where the atmosphere will undergo little synoptic change and where pollutants will accumulate. It is an important forecast parameter as pointed out later. The approximate magnitude of MXDP and TW values characterizing the several dispersion conditions are noted in the next paragraphs.

3. Dispersion Criteria.

The criteria below are offered only as a guide for base installations. The criteria were developed for St. Louis, Mo., and,for locations away from an urban area, will probably require modification. In the absence of urban pollution, dispersion conditions defined as good by these criteria will indeed be good and those defined as bad will not be quite as bad as a city area under similar meteorological conditions. Detachments can adjust these criteria based on experience with local topography, meteorology, and geographical locations or discussion with the local EMSU meteorologist.

a. Minimum Dispersion Period (morning).

Weighting Factor for Mixing Depth (MXDP)	
MXDP < 250 m	= +1
250 m ≤ MXDP < 500 m	= 0
500 m ≤ MXDP ≤ 700 m	= -1
MXDP > 700 m	= -2

Weighting Factor for Transport Wind (TW)	
TW < 2 mps	= +2
2 mps ≤ TW < 4 mps	= +1
4 mps ≤ TW < 6 mps	= 0
6 mps ≤ TW ≤ 8 mps	= -1
TW > 8 mps	= -2

b. Maximum Dispersion Period (normally afternoon).

Weighting Factor for Ventilation (Vent)	
Vent < 4000 $\frac{m^2}{sec}$	= +1
4000 $\frac{m^2}{sec}$ ≤ Vent < 6000 $\frac{m^2}{sec}$	= +0
6000 $\frac{m^2}{sec}$ ≤ Vent < 8000 $\frac{m^2}{sec}$	= -1
8000 $\frac{m^2}{sec}$ ≤ Vent	= -2

Weighting Factor for Transport Wind (TW)	
TW ≤ 2.5 mps	= +2
2.5 mps < TW ≤ 4.0 mps	= +1
4.0 mps < TW ≤ 5.0 mps	= 0
5.0 mps < TW ≤ 6.0 mps	= -1
TW > 6 mps	= -2

c. Application of Criteria. Add the weighting factors separately for morning and afternoon conditions to obtain a measure of air pollution potential. For the morning APP, add MXDP and TW weighting factors. For the afternoon APP, add the Vent and TW weighting factors. The APP index is related to dispersion as follows:

APP Index	Dispersion
+3, +2	Poor, i.e., HAPP
+1	Moderate to Poor
0	Moderate
-1	Moderate to Good
-2, -3, -4	Good

For measurable precipitation, subtract 1 from the APP index if the morning or afternoon APP is greater than zero.

4. Stagnation Area.

The term is defined in Appendix 1. It can be thought of as a geographical area over which the air mass is "quiet" and stable. A stagnation area is important to APP forecasting because it indicates an area where a persistence forecast of MXDP and TW will verify with a high probability of success. This concept is important in issuing a HAPP advisory.

5. High Air Pollution Potential (HAPP).

A HAPP advisory is the most important of the pollution forecasts. Conceivably, it could affect operation of base facilities and, certainly, it is the one to generate the widest interest with the public. The latter is especially true if a nearby city is under a pollution alert as a result of a HAPP forecast.

a. General. When poor dispersion conditions exist and are forecast to persist, for at least an additional 36 hours, a local HAPP forecast is issued to the public by the local civilian control authorities. When such conditions cover an area at least as large as a four-degree latitude-longitude square (58,000 nautical square miles), i.e., an area about the size of the state of Nebraska, then a National Air Pollution Potential Advisory is issued by NMC. The area size, incidentally, represents approximately the area circumscribed by four NMC grid points and is the minimum resolution of the fax chart. HAPP criteria are described below.

b. Criteria for Issuing a HAPP Advisory.

(1) National - See pages 12 and 13 of reference c.

(2) Base - Suggested criteria for issuing a base or installation HAPP advisory are:

(a) Detachment information indicates that:

1. Local HAPP currently exists and,

2. Is expected to persist for at least an additional 36 hours.

3. Objective threshold HAPP criteria are:

a. Morning APP will be greater than +1

b. Afternoon APP will be greater than +1

c. Stagnation is forecast for 36 hours or more.

(b) The base is adjacent to a city under a HAPP advisory and meteorological conditions at the base are similar to those of the nearby city or,

(c) The base is within the area covered by a National Advisory of HAPP.

c. Use of HAPP Advisory by Control Agency. The use of a HAPP advisory in a pollution alert system is illustrated in Appendix 4.

d. Termination of HAPP Advisory. A HAPP advisory will be terminated whenever ventilation exceeds 8000 m^3/sec or the transport wind exceeds 4.5 mps.

e. Data Sources. The NMC provides both facsimile and teletype products from which dispersion conditions can be determined. The use of these products is discussed in the next section.

SECTION C — NMC AIR POLLUTION POTENTIAL PRODUCTS

1. Introduction.

Previous sections have discussed dispersion of pollutants in general terms, finally concluding with a listing of criteria for determining dispersion conditions. This section deals with obtaining from the NMC facsimile and teletype Air Pollution Potential products the meteorological data that constitute these criteria. Application of conventional facsimile products to APP forecasting is also discussed.

2. Facsimile.

About 50 AWS detachments are on the NMC FOFAX circuit. These detachments are listed in Appendix 3. Facsimile charts, #1277 or 1577, depending on the FOFAX circuit, carry APP information and are transmitted daily at 1840Z. A detailed description of these charts appears on pages 17 to 20 of reference 2c. The use of this chart is discussed below. These charts will be transmitted twice a day (1008Z and 2205Z) beginning early in 1971.

a. Description. The data entered on this four-panel fax chart are selected primarily to assist in making National HAPP

advisories. To a limited extent, the data can also be used in making local forecasts of good and moderate dispersion conditions. Stagnation areas are forecast to 36 hours. The 4 mps TW isotach is displayed on the analysis of initial conditions and on the 12-hr forecast panel. This isotach is important because it is the threshold TW value for HAPP conditions. Initial analysis and 12-hr forecast mixing height isopleths are entered for height values of 500 m, 1500 m, 2500 m, and 3500 m.

b. Application. The chart has two applications. Primarily, it alerts the forecaster to poor dispersion conditions and to the need for a HAPP advisory. Secondarily, it can be used to a limited extent as a data source for issuing advisories of good and moderate dispersion. To use the chart as a basis of a local HAPP advisory, the forecaster examines the chart to determine if his base will be in an area governed by the criteria of paragraph 5b above. To check local TW or MXDP values, he can consult the detailed mesoscale information of FKUS-1, the local EMSU sounding, or a nearby radiosonde. Assuming HAPP criteria are met, an advisory is issued to base control authorities. The chart contains MXDP information of use in calculating good and moderate dispersion criteria; however, the entry of only the 4 mps TW isotach limits this application.

3. Teletype.

All detachments receive via Comet III circuitry the FKUS Air Pollution Potential Advisory and FKUS 1 KWBC XX 1720 Air Pollution Potential Data. Detailed information on these messages are found on page 22 of reference 2c; note that beginning early in 1971, additional messages will be transmitted at 1052Z and 2327Z daily. Application of the messages to local APP forecasts is discussed below.

a. Description.

(1) FKUS - This plain language message, in effect, notes the important points to be deduced from the APP facsimile chart. It cites, for example, possible HAPP areas, highlights of the stagnation index forecast, and the coordinates of HAPP areas. By carefully reading the message, the forecaster can obtain most of the important information appearing in the facsimile chart.

(2) FKUS 1 - This coded message provides detailed MXDP and TW information for 00Z, 12Z, and 00Z, i.e., data from yesterday afternoon, this morning, and this afternoon. Note that this afternoon's 00Z data are really a 12-hr forecast based on the 12Z sounding and winds, and that a 999 group indicates missing data.

b. Application. These two messages allow calculation of all dispersion conditions and permit issuance of a HAPP advisory. Message FKUS 1 contains MXDP and TW data, and ventilation rates can be calculated using these inputs. Forecasting beyond 12 hours is aided by noting the stagnation areas and using a persistence forecast for TW and MXDP in these areas. The inclusion of yesterday's data also allows a check on the persistence forecast; the forecaster can estimate 24-hr changes and judge the possibility of persistence holding for another 24 hours.

4. Conventional Facsimile Products.

In the absence of NMC APP products, conventional facsimile charts are of value in estimating and forecasting pollution conditions. Lower level winds can be estimated from winds-aloft charts and many of the criteria for delineating a stagnation area can be determined from the vorticity and constant pressure charts. The AWS trajectory forecasts can also help in determining stagnation areas and in forecasting lapse rates.

5. Tailoring the Forecast.

The NMC APP products can be tailored for the local AF installation. Some factors to be considered are:

a. Emission Source. APP criteria are most accurate in predicting dispersion conditions over and downwind of a large urban pollution source. The closer a base complex resembles an urban area, the more likely is the APP forecast to be accurate over all dispersion conditions. APP forecasts of very good or very poor conditions, however, are likely to verify at most AF installations.

b. Meteorological. TT and FAX data are usually calculated for points distant from the base. These data can be adjusted for local effects such as exposed locations with higher than prevailing wind speeds, elevation, etc. Note also that the afternoon MXDP forecast is made using the 12Z sounding unaltered. The only forecast is the maximum surface temperature. The afternoon TW forecast is also a no-change forecast based on the winds on the 12Z wind sounding. The local forecaster can use the base forecast maximum temperature and, perhaps, locally-observed upper winds to tailor these factors for his base. Such modifications must be used to make observed or forecast APP more representative of base conditions.

c. Topography. Locations adjacent to mountains or ridges, for example, may find air movement blocked and that pollutants accumulate despite otherwise excellent dispersion conditions. Forecast APP conditions should be adjusted accordingly, with perhaps a different weighting factor used for a TW from a particular direction.

d. Synoptic Situation. Local control authorities may be alerted to anticipated changes in the synoptic situation to enable them to prepare for improved dispersion conditions. They may also be warned in advance of impending HAPP conditions.

e. Wind Direction. The local APP index may be adjusted for wind direction. If, for example, base pollution sources are to the west of the base, then perhaps the APP index during an east wind should indicate a lower APP index, i.e., better dispersion conditions, than during a west wind.

f. Timing. Be conservative in issuing a forecast of HAPP and be equally as conservative in calling for its end.

SECTION D — CONCLUSION

The National Weather Service APP products are designed to assist the forecasting of urban pollution. These forecasts, however, can be applied to pollution forecasting at local AF installations through careful interpretation and tailoring.

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Appendix 1

DEFINITIONS AND COMMENTS

1. Introduction.

The following definitions are extracted from ETAC TN 70-9, "The National Air Pollution Potential Forecast Program." Following several of these definitions, comments have been added, and in a few cases, wording has been rearranged for editorial purposes.

2. Definitions of Pollution Terms.

a. Air Pollution Potential (APP). A measure of the inability of the atmosphere to adequately dilute and disperse pollutants emitted into it, based on values of specific meteorological parameters of the macroscale features.

b. Mixing Height. The surface-based layer in which relatively vigorous mixing occurs (meters).

c. Transport Wind Speed. A measure of the average rate of the horizontal transport of air within the mixing layer (meters per second).

d. Ventilation. The product of the mixing height and the transport wind speed. A measure of the volume rate of horizontal transport of air within the mixing layer, per unit distance, normal to the wind (meters^2 second^{-1}).

e. Stagnation Area. A combination of stable stratification, weak horizontal wind speed components,and little, if any, significant precipitation. It is usually associated with a warm-core type anticyclone.

f. Stagnation Index. An objective index of meteorological parameters used in delineating areas of large-scale stagnation in a numerical program.

3. Delineation of Stagnation Areas.

a. To delineate salient areas of stagnation, a series of meteorological parameters independent of mixing height and the transport wind speed are indexed in a numerical program on a CDC 6600 computer. The input data are wind, temperature, and stability information from the 0000Z and 1200Z RAOBS, plus the

morning (near sunrise) urban low-level sounding. Forecast information is based on data bilinearly interpolated from the grid points of the 0000Z run of the 6-layer Primitive Equation Model (PE). The critical values of these parameters are arbitrary, but independent studies indicate that during previous high air pollution potential episodes, these conditions are generally observed. Note that this evaluates stagnation independent of mixing height and transport wind. It is planned to incorporate additional parameters in this model.

b. Parameters and Critical Values for Delineating Stagnation Areas.

(1) Wind Speed. Interpolated from RAOBS and PE winds to 5000 feet above the station. Wind Speed must be less than or equal to 10 meters/second.

> NOTE: The wind speed refers to a level 5000 ft above the station, winds at 850 or 700 mb can be used for this criteria when these levels are close to 5000 ft above the station.

(2) Temperature Change. Interpolated from the RAOBS and PE FD temperatures to 5000 feet above the station. Temperature change during the last 12 hours must be greater than or equal to -5°C.

> NOTE: The temperature change parameter is a measure of cold-air advection at a level 5000 ft above the station. The criteria of -5°C means that the 5000-ft temperature must cool by 5°C or more.

(3) 500-mb Absolute Vorticity. Interpolated to the stations from the 0000Z PE run (baroclinic). Absolute vorticity must be less than or equal to $100 \times 10^{-6}\ sec^{-1}$.

(4) 500-mb Absolute Vorticity Change. Interpolated to the stations from the 0000Z PE run. Twelve-hour absolute vorticity change must be less than or equal to $+30 \times 10^{-6}\ sec^{-1}$.

> NOTE: The significance of the absolute-vorticity criteria and its change may be understood by recalling a few facts concerning the term. Absolute vorticity is the sum of relative vorticity and the earth's vorticity (equal to coriolis parameter). Relative cyclonic vorticity is positive, relative anticyclonic vorticity is negative, and the coriolis parameter is positive. This means that, as the magnitude of absolute vorticity becomes less than the given criteria, the magnitude

of the relative anticyclonic vorticity is increasing. The change criteria of paragraph (4) means essentially that an anticyclonic situation is remaining stagnant.

(5) Precipitation or Relative Hunidity. Observed precipitation during the last six hours obtained from synoptic reports at 0000Z and 1200Z must be less than or equal to .01 inch or the average relative humidity from the surface to 500 mb, interpolated to the stations from the 0000Z PE run, must be less than or equal to 80%.

4. Calculation of Mixing Height and Transport Wind Speeds.

a. Introduction. Once the stagnation areas have been determined, the next step is to calculate the mixing height and the transport wind speed. This is also done objectively on the CDC 6600 computer. The mixing heights and transport wind speeds are calculated for the morning and afternoon for all stations, but are only depicted on the facsimile package within areas of large-scale stagnation.

b. Yesterday Afternoon's Observed Mixing Height. The geometric height above the ground (meters) of the intersection of yesterday morning's 1200Z sounding with the adiabat drawn from the observed maximum temperature of the 0000Z synoptic report.

c. Yesterday Afternoon's Transport Wind Speed. The 0000Z observed average-wind-speed through yesterday afternoon's mixing layer (meters/second). The calculations include only those RAOB winds (surface winds are included) actually observed within the mixing layer. The unweighted mean of these winds form the average.

(1) Yesterday afternoon's ventilation (product of yesterday afternoon's mixing height and the transport wind speed) should be less than or equal to 6000 meters^2/second and the wind speed must be less than or equal to 4 mps within stagnation areas.

(2) Yesterday afternoon's mixing height, transport wind speed, and ventilation are not depicted on the facsimile product, but are utilized by the NMC air pollution specialist in preparing his advisory and in the verification program.

d. Urban Morning Mixing Height. The geometric height above the ground of the intersection of the 1200Z sounding with adiabat drawn from the surface minimum temperature observed plus 3° or 5°C depending on the station location. This 3° or 5°C is thought of as a measure of the urban heat-island effect during the first two hours or so after sunrise. Three degrees are

added to the minimum temperature when the RAOB or low-level sounding site is within the confines of the urban heat island. Five degrees are added to the minimum temperature when the RAOB or low-level sounding is taken at a rural site. The latter will be true for most bases. If the observed minimum temperature is missing, the 1200Z-sounding temperature plus 3° or 5°C is used to calculate the mixing height.

> NOTE: The 3° or 5°C modifies the sounding to represent atmospheric conditions at beginning of daily activities for most of the populace.

e. Morning Transport Wind Speed. The observed average-wind-speed through the urban morning mixing layer (mps). The calculations include only those winds, both RAOB and Surface, actually observed within the mixing layer. The unweighted mean of these winds form the average.

f. Afternoon Mixing Height. The geometric height above the ground (meters) of the intersection of the 1200Z sounding with the adiabat drawn from the Klein-Lewis maximum-temperature forecast from the 1200Z barotropic run.

g. Afternoon Transport Wind Speed. The 1200Z observed average-wind-speed through the afternoon mixing-layer forecast (mps). The calculations include only those RAOB winds (surface winds included) actually observed within the mixing layer. The unweighted mean of these winds form the average.

Added Comments

Mixing Height Without Inversion where no inversion or isothermal layer occurs, use the point where the lapse rate become more stable than the moist adiabatic lapse rate as the height of the MXDP. If no such lid exists below 700 mb, MXDP is unlimited.

Comments on Mixing Heights. The methods of deriving these heights are a practical answer to the computer programmer's need for an easily calculated height value. The local forecaster can usually improve the representativeness of these heights for his base. When observed data are available or when local predictions are more representative of installation conditions, mixing heights should be based on this information. Some uncertainty about the exact value of MXDP can be tolerated in calculating the afternoon APP. Note that in the afternoon APP Index, TW becomes more important than MXDP, occurring once in the calculation of the ventilation weighting factor and again as a factor by itself.

Appendix 2

EMSU LOCATION INFORMATION

1. Locations of operating Environmental Meteorological Support Units (EMSU).

   a. Philadelphia, PA

   b. New York, NY

   c. Washington, DC

   d. Chicago, IL

   e. St. Louis, MO

2. Location of EMSUs to be established in 1971.

   a. Boston, MA

   b. Cleveland, OH

   c. Pittsburgh, PA

   d. Los Angeles, CA (Two sounding sites are scheduled.)

   e. San Francisco, CA

   f. Seattle, WA

   g. Houston, TX

   h. Denver, CO

   i. Louisville, KY

3. Location of special EMSU to be established in 1971. Sacramento-Fresno area to be served by a special fixed-wing aircraft observing service.

4. The data from the morning soundings will be available as part of the USUS collective at about 1408Z. The afternoon (about 12 noon local) will only be available on an unscheduled basis.

Appendix 3

DETACHMENTS WITH FOFAX

Circuit 10206

Barksdale
Beale
Bergstrom
Buckley
Castle
Carswell
Davis-Monthan
Ent
Fairchild
Ft Wolters
Hamilton
Holloman
Kirtland
Lockbourne
March
Mather
McChord (BWS)
McChord (ADC)
McClellan
Norton
Sunnyvale
Travis
Vandenberg

Circuit 10207

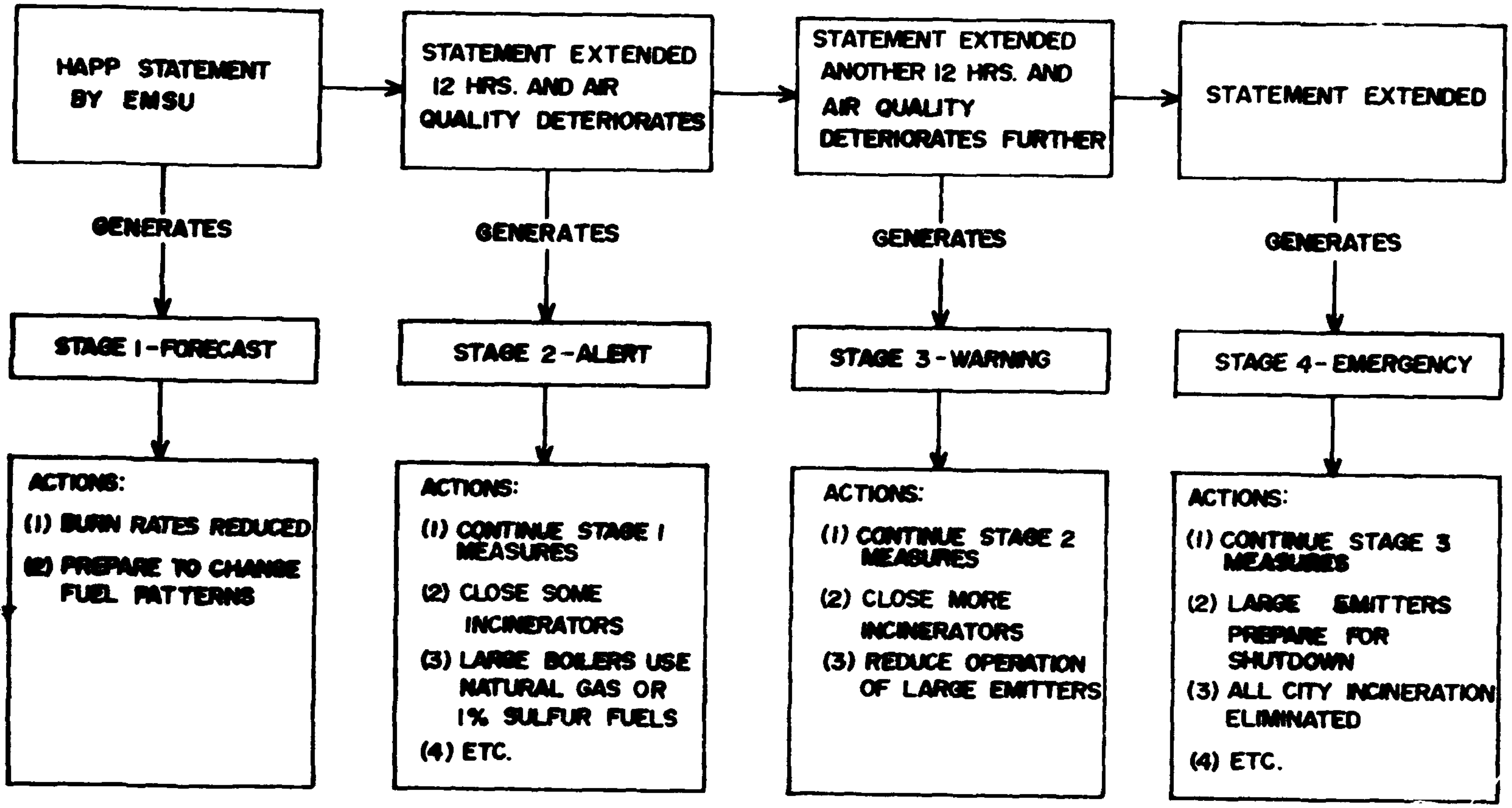
AFTAC (HQ USAF)
Dover
Loring
McGuire (21AFCP)
McGuire (BWS)
Pentagon (USAFCP)
Westover

Circuit 10208

Andrews
Charleston
Cape Kennedy
Eglin
England
Ft Benning
Ft Rucker
Homestead
Hunter
MacDill
McCoy
Myrtle Beach
Pope
Seymour-Johnson
Shaw
Langley

Appendix 4

HIGH AIR POLLUTION ALERT — WARNING SYSTEM
CITY OF NEW YORK



EXAMPLE OF INTEGRATION OF EMSU PRODUCTS INTO ALERT SYSTEM

Appendix 5

SUGGESTED AIR POLLUTION FORECAST WORKSHEET

1. Obtain appropriate FOFAX chart, teletype messages FTUS and FTUS-1, and local EMSU and radiosonde reports for the day.

2. Determine weighting factor (WF) for morning conditions:

   a. TW = ________ & TW (WF) = ________

   b. MXDP = ________ & MXDP (WF) = ________

3. Determine weighting factor for afternoon conditions.

   a. TW = ________ & TW (WF) = ________

   b. MXDP = ________ & MXDP (WF) = ________

   c. Vent = MXDP×TW = ________ & Vent (WF) = ________

4. Calculate morning APP Index.

   TW (WF) + MXDP (WF) = ________

5. Calculate afternoon APP Index.

   TW (WF) + Vent (WF) = ________

6. If APP Index is between:

   a. +1 & -1, then forecast moderate dispersion.

   b. -1 & -4, then forecast good dispersion conditions.

7. Determine if base to be in a stagnation area for 36 hours by examining FOFAX chart or FTUS. If the base is so affected, and morning and afternoon APP index > +1, then forecast HAPP.

8. Determine end of HAPP conditions by noting when ventilation exceeds 8000 m^2/sec or TW exceeds 4.5 mps.

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13. ABSTRACT

This technical note furnishes interim instructions and guidance to AWS personnel in the understanding and use of the National Meteorological Center Air Pollution Potential (APP) products. The NMC products are being transmitted over COMET III circuitry and FOFAX to the AWS detachments for their use in providing guidance to Base Pollution Control Officers. ~~This note~~ furnishes explanation of terms, application of the messages to forecast preparation, and guidelines for use in tailoring the general information furnished by NMC to local installation requirements.

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LIST OF USAF ETAC TECHNICAL NOTES

Number	Title	Date
70-1	A Selected Annotated Bibliography on Clear Air Turbulence (1964-1969) (AD-700057)	Jan 70
70-2	An Annotated Climatological Bibliography of the BENELUX Countries (1960-1969) (AD-701692)	Feb 70
70-3	Listing of Available Seminars (AWS Wings) (AD-702463)	Mar 70
70-4	A Selected Annotated Bibliography of Environmental Studies of Israel (1960-1969) (AD-705199)	Apr 70
70-5	A Selected Annotated Bibliography of Environmental Studies of Iraq, Jordan, Lebanon, and Syria (AD-707120)	May 70
70-6	A Selected Annotated Bibliography of Environmental Studies of Poland (AD-709762)	Jun 70
70-7	Air Force Eastern Test Range Computer, "Printed" Rawinsonde (SKEW-T) Analysis (AWS distribution only) (AD-691228)	Jul 70
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70-9	The National Air Pollution Potential Forecast Program (AD-714568)	Nov 70
70-10	A Selected Annotated Bibliography of Environmental Studies of Argentina, Chile, and Uruguay (AD-717196)	Dec 70
71-1	Interim Instructions for the Use of the National Meteorological Center Air Pollution Potential (APP) Products (AWS distribution only) (AD-)	Feb 71